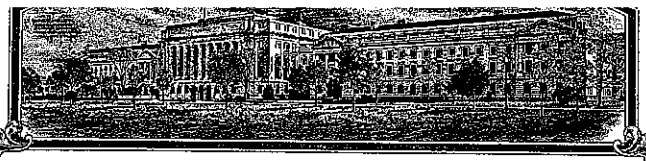
No. 9900064



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'54H55'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-fourth day of April, in the year of our Lord two thousand one.

Attest:

Alan R. Post

Acting Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions.* FORM APPROVED - OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Pioneer Hi-Bred International, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
X54H55

3. VARIETY NAME
54H55

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
7305 N.W. 62nd Ave.
P.O. Box 287
Johnston, IA 50131

5. TELEPHONE *(include area code)*
(515) 270-3347

6. FAX *(include area code)*
(515) 270-3750

FOR OFFICIAL USE ONLY

PVPO NUMBER 9900064

FILING DATE 11/23/98

FEES RECEIVED
FILING AND EXAMINATION FEE: $ 2450.00
DATE 11/23/98
CERTIFICATION FEE: $ 320.00
DATE 4/13/01

7. GENUS AND SPECIES NAME
Medicago sativa

8. FAMILY NAME *(Botanical)*
Leguminosae

9. CROP KIND NAME *(Common name)*
Alfalfa

10. IF THE APPLICANT NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.) (Common name)*
Corporation

11. IF INCORPORATED, GIVE STATE OF INCORPORATION
Iowa

12. DATE OF INCORPORATION
May 6, 1926

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS

Mark A. Smith
7305 N.W. 62nd Ave.
P.O. Box 287
Johnston, IA 50131-0287

mary Letsch, Dept of Alfalfa Research
7305 N.W. 62ND AVE
Johnston, IA 50131

Jean M. Bromert
7100 NW 62nd Avenue
P.O. Box 1000
Johnston, IA 50131-1000

14. TELEPHONE *(include area code)*
(515) 270-3347

15. FAX *(include area code)*
(515) 270-3750

16. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow instructions on reverse)*

- a. ☑ Exhibit A. Origin and Breeding History of the Variety
- b. ☑ Exhibit B. Statement of Distinctness
- c. ☑ Exhibit C. Objective Description of the Variety
- d. ☑ Exhibit D. Additional Description of the Variety (Optional)
- e. ☑ Exhibit E. Statement of the Basis of the Applicant's Ownership
- f. ☑ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in an approved public repository)*
- g. ☑ Filing and Examination Fee ($2450), made payable to "Treasurer of the United States" *(Mail to PVPO)*

17. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*

☐ YES *(If "yes," answer items 18 and 19 below)* ☑ NO *(If "no," go to item 20)*

18. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?

☐ YES ☐ NO

19. IF "YES" TO ITEM 18, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?

☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

20. HAS THE VARIETY OR A HYBRID PRODUCED FROM THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?

☑ YES *(If "yes," give names of countries and dates)* ☐ NO March, 1998, USA

21. The applicant(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*		SIGNATURE OF APPLICANT *(Owner(s))*	
Mark A Smith			
NAME *(Please print or type)*		NAME *(Please print or type)*	
Mark A. Smith			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Research Manager	11/18/98		

STD-470 *(Previous editions are to be destroyed)* *(See reverse for instructions and information collection burden statement)*

EXHIBIT A

ORIGIN AND BREEDING HISTORY OF THE VARIETY

'54H55'

54H55 is a synthetic variety made up from 225 random parent plants crossed in "Cage Isolation" in 1996. Parent plants trace to N95SP48, which was developed to resist a new biotype of blue aphid (BA2 and or BAOK90) endemic to the south central part of the US. Using phenotypic recurrent selection since 1991 parental germplasm was selected for resistance to the new biotype of blue aphid (BA2). Final selections were additionally selected for Phytophthora root rot, stem nematode, northern root knot nematode, bacterial wilt, and Fusarium wilt. 54H55 traces to the following: KS219 (13%), Lobo (8%), 555 (6%), Anchor (5%), WL322HQ (5%), CUF101 (3%), 5454 (2%), Apollo (2%), NCMP10 (1%), Saranac AR (1%), 5444 (1%), Kanza (1%), 5432 (1%), DK125 (1%) and 524 (1%). Minor contributions from the following: Europe, WL316, Armor, 532, 5333, Centurion, Saranac, Magnum III, Edge, Envy, Apollo II, Arc, Mercury and others. The remainder traces to numerous Pioneer experimentals.

This variety was observed over three generations and found to be uniform and stable.

No variants were observed during seed (breeder, foundation and commercial) multiplication procedures.

It is confirmed that 54H55 meets presently acceptable levels for uniformity for alfalfa varieties.

EXHIBIT B

NOVELTY STATEMENT

'54H55'

54H55 most closely resembles the variety 5715 for resistance to three aphids. These are: pea aphid (54H55 = 56.3%, 5715 = 82.5%), spotted alfalfa aphid (54H55 = 62.6%, 5715 = 92.6%), and Blue aphid biotype 1 (54H55 = 53.0%, 5715 = 92.7%). 54H55 differs from all varieties in resistance to a new biotype of blue aphid (BAOK90 or BA2) (1,2,3,4).

Other traits of difference include dormancy (54H55 = 5, 5715 = 8) and resistance to: Verticillium wilt (54H55 = 54.6%, 5715 = 11.2%), Phytophthora root rot (54H55 = 82.2%, 5715 = 35,3%), blue aphid biotype 2 (54H55 = 53.1%, 5715 = 0.0%), and stem nematode (54H55 = 62.5%, 5715 = 15.2%).

Resistance to the new Blue aphid biotype designated as BAOK90 and BA2 in the literature has not been found until the release of 54H55 (1,2,3,4). Resistant checks to the standard biotype of blue aphid are not resistant to BAOK90. This was confirmed in Pioneer tests as well as in an independent test run by Oklahoma State University (1,4).

Pioneer test is included in Exhibit C.

Test Location: Stillwater, OK
Date: 1997

Variety	Percent Resistant Plants
54H55	58.9
CUF101	28.0
ARC	4.3
LSD	8.2

1. Hoard, G.E., M.A. Smith, F. Loiselle, D.J. Miller, and W.T.W. Woodward. 1997. Resistance to a New Blue Aphid Biotype. Proc. of the 25th Central Alfalfa Improv. Conf. pp. 48.

2. Zarrabi, A.A., R.C. Berberet, and J.L. Caddel. 1995. New Biotype of *Acyrthosiphon kondoi* (Homoptera: Aphididae) on alfalfa in Oklahoma. J. Econ. Entomol. 88:1461-1465.

3. Zarrabi, A.A., R.C. Berberet, and J.L. Caddel. 1996. Evaluations of resistance to new biotype of blue alfalfa aphid, *Acyrthosiphon kondoi*, Shinji, "BAOK90". Proc.of the 35th North American Alf. Improv. Conf. p. 17.

4. Zarrabi, A. A., R.C. Berberet, A.D. Bisga, and J. L. Caddel. 1998. Yield and Stand Reduction Caused by a New Biotype of Blue Alfalfa Aphid in Oklahoma. Proc. of the 36th North American Alfalfa Improv. Conf. pp 61-62.

Resistance to a New Blue Alfalfa Aphid Biotype

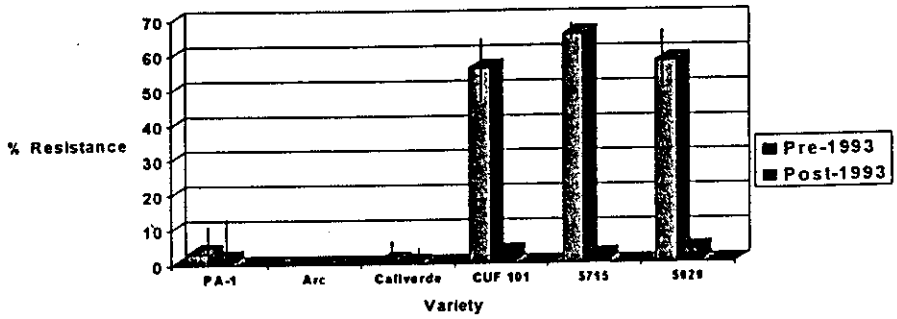
9900064

Gary Hoard, Mark Smith, François Loiselle, Dave Miller, and Tim Woodward
Pioneer Hi-Bred International, Inc

Screening and evaluation of alfalfa varieties for resistance to the blue alfalfa aphid (BAA) *Acyrthosiphon kondoi* Shinji was initiated at the Pioneer Hi-Bred International, Inc. Alfalfa Research Station in Johnston, IA in 1985. Typically, several greenhouse BAA evaluations are run at the station each year, along with a significant amount of screening as part of a recurrent selection program to improve resistance to the insect. In 1989, researchers at New Mexico State University reported the possible existence of a new biotype of BAA (4). Berberet, Zarrabi, and Caddel also reported the possible occurrence of a new biotype in Oklahoma, which was named BAOK90 (2,3,5,6). Resistance of standard checks CUF 101 and OK 51 ranged from 12-15% and 8-10%, respectively when tested with the new biotype in the Oklahoma tests. CUF 101 and OK 51 acceptable resistance ranges are 40-65% and 30-60%, respectively.

Resistant check CUF 101 and Pioneer variety 5929 have consistently shown high resistance to BAA in Pioneer evaluations run from 1985 through 1992 but have rated susceptible to low resistance since 1993. Susceptible checks have reacted as would be expected in a BAA test. Based on the reaction of the BAA (original biotype) checks, it appears that we are working with the same BAA biotype (BAOK90) reported by Oklahoma State University (2,3,4,6). This would not be surprising since many insects arrive in Iowa via southerly winds (spotted alfalfa aphid, potato leafhopper, etc.).

Several Pioneer experimentals and two cultivars exist with resistance to BAOK90. Realized heritability estimates were found to average between .15 and .55 depending upon population and cycle of selection. Pioneer variety 54H55 was rated highly resistant in a 1997 Pioneer test as well as in an independent test not shown. There is some difficulty in ratings, however, due to the lack of a good standard resistant check. It is not known how widespread the new biotype is, but since it is suspected as the cause of severe damage in Oklahoma and New Mexico, it is important to develop varieties with resistance to the insect. As there currently is no standard test protocol available for this biotype, it is important to identify check cultivars and develop a procedure to classify alfalfa varieties for resistance to BAOK90.



Pre-1993 versus post-1993 average percent resistant plants (unadjusted) for the BAA standard checks and Pioneer varieties 5715 and 5929 which are known to be resistant to the original BAA biotype

References

1. Berberet, R. C., A. A. Zarrabi, and J. L. Caddell. 1991. Blue alfalfa aphid resistance. In Standard tests to characterize alfalfa cultivars. Fox, C. C. Et al. Eds. North Amer. Alf. Improv. Conf.
2. Berberet, R. C., A. A. Zarrabi, and J. L. Caddell. 1992. Possible occurrence of a new biotype of blue aphid. Rep. 33rd North Amer. Alf. Improv. Conf. p. 20.
3. Berberet, R. C., A. A. Zarrabi, and J. L. Caddell. 1994 A new biotype of the blue alfalfa aphid, *Acyrthosiphon kondoi*, Shinji, on alfalfa. Rep. 34th North Amer. Alf. Improv. Conf. p. 58.
4. Kimmell, J. L., C. G. Currier, and B. A. Melton. 1989. Identification of a possible new blue aphid biotype. Proc. of the Sixth Western Alfalfa Improv. Conf. pp. 19-20.
5. Zarrabi, A. A., R. C. Berberet, and J. L Caddel. 1995. New biotype of *Acyrthosiphon kondoi* (Homoptera: Aphididae) on alfalfa in Oklahoma. J. Econ. Entomol. 88:1461-1465.
6. Zarrabi, A. A., R. C. Berberet, and J. L Caddel. 1996. Evaluations of resistance to new biotype of blue alfalfa aphid, *Acyrthosiphon kondoi*, Shinji, "BAOK90". Rep. 35th North Amer. Alf. Improv. Conf. p. 17.

5

9900064

FORM APPROVED OMB NO. 0581 0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(ALFALFA)

OBJECTIVE DESCRIPTION OF VARIETY
ALFALFA *(Medicago sativa* sensu Gunn et al.)

NAME OF APPLICANT(S)	TEMPORARY DESIGNATION	VARIETY NAME
Pioneer Hi-Bred International, Inc.	X54H55	54H55

ADDRESS *(Street and No., or R.F.D. No., City, State, and Zip Code)*
7305 N.W. 62nd Ave., P.O. Box 287
Johnston, IA 50131

FOR OFFICIAL USE ONLY
PVPO NUMBER

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place numbers in the boxes to designate the expressions which are characteristic of the commerical generations of the application variety. Data for quantitative plant characters should be based on a minimum of 100 plants. Include leading zeros when necessary (e.g. 0 8 9 for quantitative data. Comparative data should be determined from varieties entered in the same trial.Plant color may be precisely designated by using any recognized color chart.e.g., The Munsell Plant Tissue Color Charts.

1. WINTERHARDINESS:

[6] CLASS:

1 = Very Non-Winterhardy (CUF 101)
2 = Non-Winterhardy (Moapa 69)
3 = Intermediately Non-Winterhardy (Mesilla)
4 = Semi-Winterhardy (Lahontan)
5 = (Du Puits)
6 = Moderately Winterhardy (Saranac)
7 = (Ranger)
8 = Winterhardy (Vernal)
9 = Extremely Winterhardy (Norseman)

TEST LOCATION: Arlington, WI

2. FALL DORMANCY:

FALL DORMANCY (DETERMINED FROM SPACED PLANTINGS)

TESTING INSTITUTION AND LOCATION	DATE OF LAST CUT	DATE REGROWTH SCORED	REGROWTH SCORE OR AVERAGE HEIGHT				LSD .05
			APPLICATION VARIETY	CHECK VARIETIES*			
				Legend	5246	Archer	
Pioneer Hi-Bred International, Inc. Arlington, WI	9/2/97	10/01/97	30.8	25.4	24.7	31.5	2.6

* CUF 101, Moapa 69, Mesilla, Lahontan, Du Puits, Saranac, Ranger, Vernal, or Norseman as appropriate.

Specify scoring system used: Natural plant height in cm

[4] Fall Growth Habit (Determined from Fall Dormancy Trials)

1 = Erect (CUF 101)
3 = Semierect (Mesilla)
5 = Intermediate (Saranac)
7 = Semidecumbent (Vernal)
9 = Decumbent (Norseman)

3. RECOVERY AFTER FIRST SPRING CUT (In Southwest, first cut after March 21):

[3]

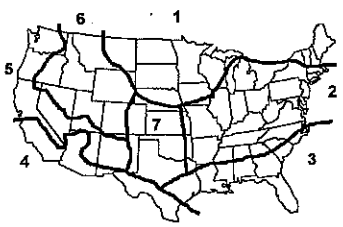
1 = Very Fast (CUF 101)
3 = Fast (Saranac)
5 = Intermediate (Ranger)
7 = Slow (Vernal)
9 = Very Slow (Norseman

TEST LOCATION: Connell, WA

4. AREAS OF ADAPTATION IN U.S. (Where tested and proven adapted):

[7] Primary Area of Adaptation

[2] [6] Other Areas of Adaptation



1 = North Central
2 = East Central
3 = Southeast
4 = Southwest
5 = Moderately Winterhardy Intermountain
6 = Winterhardy Intermountain
7 = Great Plains
8 = Other *(Specify)* Moderately winterhardy intermountain (5)

5. FLOWERING DATE (When 10% of plants possess open flowers at time of first spring cut):

[ ] Days Earlier Than . . . . . [ ]
Same As . . . . . [ ]
[ ] Days Later Than . . . . . [ ]

1 = CUF 101
2 = Mesilla
3 = Saranac
4 = Vernal
5 = Norseman

TEST LOCATION:

6

6. PLANT COLOR (Determined from healthy regrowth 3 weeks after first spring cut, controlling leafhoppers if necessary):

[ ] 1 = Very Dark Green (524) 2 = Dark Green (Vernal) 3 = Light Green (Ranger)

COLOR CHART VALUE *(Specify chart used)* _____

APPLICATION VARIETY: _____

VERNAL: _____

TEST LOCATION: _____

7. CROWN TYPE (Determined from spaced plantings):

[ ] Noncreeping Types: 1 = Broad (Vernal) 2 = Intermediate (Saranac) 3 = Narrow (CUF 101)

Creeping Types: 4 = Creeping Rooted (Rangelander) 5 = Rhizomatous (Rhizoma)

8. FLOWER COLOR (Determine frequency of plants for each color class as defined by USDA Agricultural Handbook No. 424 (Barnes 1972), allowing all plants in plot to flower):

094	% Purple and Violet (Subclasses 1.1 to 1.4)	-	% Blue (Subclasses 2.3 and 2.4)
006	% Variegated Other Than Blue (Subclasses 2.1, 2.2, 2.5 to 2.9)	t	% Yellow (Subclasses 4.1 to 4.4)
t	% Cream (Class 3)	t	% White (Class 5)

TEST LOCATION: Connell, WA

9. POD SHAPE (Determine frequency of plants with the following pod shapes produced on well cross-pollinated racemes):

[ ] % Tightly Coiled (One or more coils, center more or less closed) [ ] % Loosely Coiled (One or more coils, center conspicuously open)

[ ] % Sickle (Less than 1 coil) TEST LOCATION: _____

10. PEST RESISTANCE: Provide in the appropriate column, trial data for application variety, and resistant (R) and susceptible (S) check varieties, synthetic generation tested, average severity index scores (ASI), least significant difference statistics (LSD .05), the institution in charge of test, year, and location of test, and whether test is a field or laboratory evaluation. Describe scoring system, and any test procedure which differs from standard methods proposed by Elgin (1982). Trial data from other test years or locations should be presented whenever available on a separate document as Exhibit D.
Seeds of the check varieties and germplasm lines listed below can be obtained from the USDA Field Crops Laboratory, Bldg. 001, Rm. 335, BARC-West, Beltsville, MD 20705. Although comparisons with check varieties listed below are preferred, comparisons with any appropriate check variety recommended by Elgin (1982) may be presented.

A. DISEASE RESISTANCE: DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Anthracnose, Race 1 *(Colletotrichum trifolii)*	Application R	1	35.9	~125		% Resistant Plants 14.2	Pioneeer Hi-Bred Int'l, Inc. 1997 Arlington, WI Laboratory
	Arc (R)		65.0	~125			
	Saranac (S)		0.0	~125			
	SCORING SYSTEM: Standard test						
Anthracnose, Race 2 *(Colletotrichum trifolii)*	Application						
	Saranac AR (R)						
	Arc (S)						
	SCORING SYSTEM:						
Bacterial Wilt *(Corynebacterium insidiosum)*	Application HR	1	~~52.0~~ 54	~200		% Resistant Plants 11.6	Crop Characteristics 1998 Farmington, MN Laboratory
	Vernal (R)		~~42.0~~ 41	~200			
	Narragansett (S)		4.0	~200			
	SCORING SYSTEM: Standard test						
Common Leafspot *(Pseudopeziza medicaginis)*	Application						
	MSA-CW3An3 (R						
	Ranger (S)						
	SCORING SYSTEM:						

per correspondence of 1-11-99 MAH 12-22-00

10. A. PEST RESISTANCE (Continued):

DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Downy Mildew *(Peronospora trifoliorum)*	Application						
Isolate, if known:	Saranac (R)						
	Kanza (S)						
	SCORING SYSTEM:						
Fusarium Wilt *(Fusarium oxysporum f. medicaginis)*	Application						
	Agate (R)						
	MNGN-1 (S)						
	SCORING SYSTEM:						
Phytophthora Root Rot *(Phytophthora megasperma f. medicaginis)*	Application HR	1	82.2	~160		% Resistant Plants 14.1	Pioneer Hi-Bred Int'l, Inc. 1997 Arlington, WI Laboratory
Per correspondence of 1-11-99 MAH 12-22-00	Agate (R)		~~70.1~~ 33	~160			
	Saranac (S)		0.0	~160			
	SCORING SYSTEM:	Standard test					
Verticillium Wilt *(Verticillium alboatrum)*	Application R	1	~~49.9~~ 54.6	~125		% Resistant Plants 13.2	Pioneer Hi-Bred Int'l, Inc. 1997 Arlington, WI Laboratory
	Oneida VR(R)		~~47.5~~ 60	~125			
	Saranac (S)		~~5.2~~ 2.6	~125			
	SCORING SYSTEM:	Standard test					
Other *(Specify)* Aphanomyces root rot	Application LR	1	6.7	~175		% Resistant Plants 9.8	Pioneer Hi-Bred Int'l, Inc. 1997 Arlington, WI Laboratory
Aphanomyces euteiches	WAPH-1(		50.0	~175			
	Saranac		1.7	~175			
	SCORING SYSTEM:	Standard test					
Other *(Specify)*	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

B. INSECT RESISTANCE: INSECT	VARIETY	SYN. GEN. TESTED	PERCENT DEFOLIATION	DEFOLIATION IN PERCENT OF RESISTANT CHECK	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Alfalfa Weevil *(Hypera postica)*	Application						
	Arc (R)			100			
	Saranac (S)						
	SCORING SYSTEM:						

10. B. INSECT RESISTANCE (Continued):

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT SEEDLING SURVIVAL	NUMBER OF SEEDLINGS TESTED	ASI	ASI LSD .05	INSTITUTION. YEAR. LOCATION. FIELD OR LABORATORY
Blue Alfalfa Aphid *(Acyrthosiphon kondoi)*	Application HR	1	53.0	~100		% Resistant Plants 9.4	Crop Characteristics 1996 Farmington, MN Laboratory
	CUF101 (HR)		55.0	~100			
	Caliverde (S)		2.0	~100			
	SCORING SYSTEM: Standard test						
Pea Aphid *(Acyrthosiphon pisum)* Per correspondence of 1-11-99 MAH 12-22-00	Application HR	1	56.3	~300		% Resistant Plants 15.8	Pioneer Hi-Bred Int'l, Inc. 1998 Johnston, IA Laboratory
	Baker (R)		~~28.1~~ 55	~300			
	Ranger (S)		3.9	~300			
	SCORING SYSTEM: Standard test						
Spotted Alfalfa Aphid *(Therioaphis maculata)* *Biotype, if known:*	Application HR	1	62.8	~300		% Resistant Plants 21.1	Pioneer Hi-Bred Int'l, Inc. 1998 Johnston, IA Laboratory
	CUF101 (HR)		60.0	~300			
	Arc (S)		0.0	~300			
	SCORING SYSTEM: Standard test						

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION. YEAR. LOCATION. FIELD OR LABORATORY
Potato Leafhopper Yellowing *(Empoasca fabae)*	Application						
	PLH40 (MR)						
	Ranger (S)						
	SCORING SYSTEM:						
Other *(Specify)* Blue alfalfa aphid (Biotype 2) (Acyrthosiphon kondoi)	Application HR	1	53.1	~100		% Resistant Plants	Pioneer Hi-Bred Johnston Iowa 1998
	(S) Caliverde		0.8	~100			
	(S) CUF 101		6.4	~100			
	SCORING SYSTEM: Plants scored on a 1-5 scale with 1=no insect damage and 5=dead plants. Plants scored 1-3 considered resistant. (No resistant check has been determined) (No standard test has been described)						

C. NEMATODE RESISTANCE:

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION. YEAR. LOCATION. FIELD OR LABORATORY
Northern Root Knot *(Meloidogyne hapla)* Correction MAH 12-22-00	Application HR	1	59 ~~51.0~~ 55	~250		% Resistant Plants 16.2	Pioneer Hi-Bred Int'l, Inc. 1997 Connell, WA Laboratory
	SYN YY (HR)		90 ~~83.3~~ 82	~250			
	Lahontan (S)		0 ~~9.1~~ 06	~250			
	SCORING SYSTEM: Standard test						

10. C. NEMATODE RESISTANCE (Continued): 9900064

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Southern Root Knot *(Meloidogyne incognita)*	Application						
	Moapa 69 (R)						
	Lahontan (S)						
	SCORING SYSTEM:						
Stem Nematode *(Ditylenchus dipsaci)*	Application HR	1	62.5	~250		% Resistant Plants 11.7	Pioneer Hi-Bred Int'l, Inc. 1997 Connell, WA Laboratory
	Vernema (R)		60.2	~250			
	Ranger (S)		10.1	~250			
	SCORING SYSTEM: Standard test						
Other *(Specify)*	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

11. INDICATE THE VARIETY THAT MOST CLOSELY RESEMBLES THE APPLICATION VARIETY FOR EACH OF THE FOLLOWING CHARACTERS:

CHARACTER	VARIETY	CHARACTER	VARIETY
Winterhardiness	Archer	Plant Color	-
Recovery After 1st Cut	5312	Crown Type	-
Area of Adaptation	54Q53	Combined Disease Resistance	53V08
Flowering Date	-	Combined Insect Resistance	5715

REFERENCES

Barnes, D.K. 1972. A System for Visually Classifying Alfalfa Flower Color. U.S. Dep. Agric. Handb. 424. 18 pp. (Note: Greenish cast of plate 6, A and B is an artifact of printing, actual colors a blend of yellow and white.)

Elgin, J.H., Jr., (ed.). 1982. Standard Tests to Characterize Pest Resistance in Alfalfa Cultivars. U.S. Dep. Agric. Tech. Bull. (In Press).

Gunn, C.R., W.H. Skrdla, and H.C. Spencer. 1978. Classification of Medicago sativa L. using legume characters and flower colors. U.S. Dep. Agric. Tech. Bull. 1574. 84 pp.

Munsell Color Co. 1977. Munsell Plant Tissue Color Charts. Munsell Color Co., Inc. Baltimore.

NOTE: Any additional descriptive information and supporting documentation may be provided as Exhibit D.

Exhibit D

' 54H55'

1. 54H55 is a synthetic variety made up of 225 random parent plants crossed in "Cage Isolation" in 1996. Parent plants trace to N95SP48, which was developed to resist a new biotype of blue aphid (BA2 and or BAOK90) endemic to the south central part of the US. Using phenotypic recurrent selection since 1991 parental germplasms were selected for resistance to the new biotype of blue aphid (BA2). Final selections were additionally selected for *Phytophthora* root rot, stem nematode, northern root knot nematode, bacterial wilt, and *Fusarium* wilt. 54H55 traces to the following: KS219 (13%), Lobo (8%), 555 (6%), Anchor (5%), WL322HQ (5%), CUF101 (3%), 5454 (2%), Apollo (2%), NCMP10 (1%), Saranac AR (1%), 5444 (1%), Kanza (1%), 5432 (1%), DK125 (1%) and 524 (1%). Minor contributions from the following: Europe, WL316, Armor, 532, 5333, Centurion, Saranac, Magnum III, Edge, Envy, Apollo II, Arc, Mercury and others. The remainder trace to numerous Pioneer experimentals.

2. 54H55 is intended for use in the great plains, east central, and winter hardy intermountain regions of the United States where blue aphid is present. The states in which 54H55 have been tested are Iowa, Oregon, Washington, Oklahoma, and Wisconsin.

3. 54H55 is a moderately dormant cultivar with fall dormancy similar to Archer. Growth habit is erect in midsummer and semi-erect in the fall. Flower color in the Syn.1 generation is approximately 94% purple and 6% variegated, with traces of yellow, white and cream.

4. 54H55 is highly resistance to blue aphid (biotype 2), blue aphid (1), stem nematode, *Phytophthora* root rot, pea aphid, and spotted alfalfa aphid; resistant to *Anthracnose* (race 1) and ~~*Verticillium* wilt; moderate resistance to northern root knot nematode~~; and low resistance to *Aphanomyces* root rot (race 1).

   Verticillium wilt, Bacterial wilt, and Northern Root Knot Nematode per Correspondence of 1-11-99 MAH 12-22-00

5. Breeder's seed (Syn 1) was produced on 225 in cage isolation and bulked. Seed classes will be breeder, foundation (Syn 2 or Syn 3), and certified (Syn 3 or Syn 4). Foundation seed may be produced from breeder or foundation. The second-generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Limitations of age of stand will be three and five years, respectively, for foundation and certified seed.

6. Seed will be marketed the spring of 1998.

9900064

7. Application for Plant Variety Protection will be made, and the certification option will not be requested.

8. As a means of added varietal protection, information with the Application for Review of Alfalfa Varieties for Certification may be provided to the PVP office.

9. Variety Name: 54H55 Date submitted: November , 1998

10. Experimental designation: X54H55

REPRODUCE LOCALLY. *Include form number and date on all reproductions.* FORM APPROVED - OMB NO. 0581-0055 EXPIRES: 12-31-96

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Pioneer Hi-Bred International, Inc.	X54H55	X54H55

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*	5. TELEPHONE *(include area code)*	6. FAX *(include area code)*
7305 N.W. 62nd Ave. P.O. Box 287 Johnston, IA 50131	(515) 270-3347	(515) 270-3750
	7. PVPO NUMBER	

8. Does the applicant own all rights to the variety? *Mark an "X" in appropriate block.* If no, please explain. [X] YES [ ] NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company?
If no, give name of country _____ [X] YES [ ] NO

10. Is the applicant the original breeder? If no, please answer the following: [X] YES [ ] NO

a. If original rights to variety were owned by individual(s):
Is (are) the original breeder(s) a U.S. national(s)? If no, give name of country _____ [ ] YES [ ] NO

b. If original rights to variety were owned by a company:
Is the original breeder(s) U.S. based company? If no, give name of country _____

11. Additional explanation on ownership *(if needed, use reverse for extra space):*

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeders(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original breeder, both the original breeder and the applicant must meet one of the above criteria.

The original breeder may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.